

POSITIVE DEVELOPMENT

Background

The stated goal of the NCS is to study the impact of the environment on child health. This includes both positive and negative aspects of biological health as well as development in the cognitive, social and emotional domains of human functioning. This hypothesis is concerned with those positive aspects of child health included under the social, emotional, and cognitive domains. It is designed from the perspective that clear and authoritative information on how the physical, chemical, and social dimensions of the environment may negatively impact child health will only emerge against a backdrop of information about the course of positive development and its environmental influences. This perspective emerges from evolutionary, systems, and life-course principles pertaining to human action and behavioral development (Alexander, 1990; Bogin, 1997; Ford & Lerner, 1992).

As with all species, evolution has endowed human beings with the potential for positive development in all areas of socio-biological functioning. Yet, as complex, phylogenetically-advanced, self-organizing beings, the plans laid down in genes for realizing the goal of positive development across these varied areas of functioning are quite open. This openness allows for the variations in opportunities, challenges, and demands in complex ecologies (Brandstedter & Lerner, 1999). There is substantial plasticity in every system, albeit the level of plasticity varies across systems and through epochs of development. Positive development in some component systems is more fragile, more dependent on positive development in other systems; that is, for some component systems there is high intra-system or high inter-system dependency. Likewise, positive development in some systems is more fragile during particular developmental epochs (typically during times of rapid organismic change or periods of high age-related social pressure). Positive development in all systems is dependent on support from the physical and social environment, but dependency is greater in some systems than others. Unfortunately, from the standpoint of the key issues being addressed by the NCS, all aspects of positive development are susceptible to damage and delay as a function of exposure to various classes of physical, chemical, biological, and social agents. Several negative impacts on aspects of positive development have been identified in other hypotheses submitted for consideration by NCS Workgroups (e.g., the negative impact on attention processes that can result from exposure to certain classes of chemical agents and the negative impact on self-regulatory competence and language that can occur as a function of prenatal exposure to alcohol and drugs). However, these negative consequences for children have not typically been portrayed as representing aspects of the larger realm of decrements to positive development that occur as a result of exposures to potentially deleterious agents. Although these generic principles regarding development are generally well accepted, there is limited documentation of precisely how they play out through the life-course for each component developmental system (and its connected subsystems) and, particularly, how the course of development is affected by variations in the complex physical and social ecologies humans inhabit.

Given that the central mission of the NCS is to illuminate how exposures to various classes of physical, chemical, biological, and social agents compromise health and well-being, it is appropriate that substantial attention be given to better understanding how exposure to particular agents results in increased risk of key health problems (e.g., diabetes, ADHD, autism, depression). The costs to the individuals who have such significant illnesses are considerable; as well the costs to society. Less well understood are the consequences of compromises to positive development, for those have not typically be the targets of studies that examine the impacts of the kinds of agents likely to be emphasized in the NCS. To briefly illustrate the potential significance of examining impacts on positive development, consider the following: the decrement in language and intellectual competence that might accrue to exposure to certain chemical agents and social environments may not result in a documentable bad outcome such as school failure or delinquency (although evidence indicates that it sometimes does, Shonkoff & Phillips, 2002; Sampson et al., 2000). Rather it may increase the likelihood that a particular adolescent will not

do well in school, not go to college or not complete college. The consequences of such eventualities can be considerable, including less stable and productive employment and decreased likelihood of family stability, effective community participation, and creative productivity. Weiss (2000) presents a compelling argument regarding the cascading losses of potential that can accrue to degraded intellectual potential as a consequence of early neurotoxic exposures such as lead. Similarly, Sampson et al (2000) argue for a "multivariate strategy that can characterize the behavioral consequences of alcohol-related brain damage", most of which may well be subclinical but nonetheless highly significant for overall adaptive functioning. Likewise, a decrement in self-regulatory competence that emerges as a consequence of exposure to alcohol in utero may not result in a diagnosable psychopathology such as schizophrenia (Olney, 1999). But it may mean less effective social relationships, weaker social networks, and less steady participation in school and community activities. These may eventually lead to less stable employment, fewer promotions, decreased likelihood of family formation and maintenance and decreased likelihood of productive connections with social institutions. Rice and Barone (2000) provide a review of a wide array of neurotoxic agents on human functioning (from exposure to substances such as ethanol, methyl mercury and chlorpyrifos to fetal malnutrition). They discuss the linkages between such exposures and significant downstream health problems (e.g., ADHD, schizophrenia, retardation). However, they make clear that such exposures are far less likely to result in diagnosable pathologies as they are to cause decrements in such basic aspects of positive development as executive functioning, self-regulation, and sensory-motor functioning. They conclude that these "small effects can have a profound societal impact when amortized across the entire population and across the life span of humans". The point here is that relatively modest impacts on key aspects of positive development can result in a cascade of events that substantially reduce the life prospects of individuals and their potential contribution to society. The costs to both can be considerable. Positive development contributes to productive functioning in every sphere of human endeavor, thus decrements can have very severe and long-lasting consequences. Moreover, despite the fact that much remains to be determined about the consequences of exposure to certain physical, chemical, and social agents, the available evidence suggests that many more people are likely to be affected in terms of decrements to key aspects of positive development than may manifest diagnosable illnesses.

Although positive development has always been important for human survival and adaptive functioning, a strong case can be made that positive development in every domain of human functioning will have increased importance in the 21st Century. Positive development connotes more than just the absence of pathology. Below we describe 8 areas of competence that define positive development in the context of the complex, rapidly changing world of the 21st century. First, in technologically-advanced, rapidly changing, and highly mobile societies, cognitive and social competence are required for normal, everyday living. Correspondingly, the increased complexity and more rapid pace of life puts greater pressure on emotional functioning at a time when many of the traditional social structures, values, and institutions can no longer provide the infra-structure of support needed for positive emotional health.

The need for attention to positive development is perhaps most readily illustrated for cognitive development; specifically, in a knowledge-driven economy the need for intellectual attainment and flexibility is high, as reflected in society's press for school success and more schooling. Almost as obvious is the need for high social and emotional competence: increased urbanization and anonymity, high mobility, frequent career/job changes, smaller families, less tightly connected networks of kith and kin, and greater divisions along generational lines all press for the development of high social skills. Again the press for advanced social skills is increasing just when many of the traditional social institutions and structures are struggling to provide the support needed to maintain adaptive functioning. To some degree, the increased prevalence of family dissolution, juvenile delinquency, and stress-related emotional problems provides evidence of the difficulty attendant to living in the current era and of the need for positive development in the emotional domain as well as in the other domains of human functioning.

Current theories of human development are generally in accord with regard to two principles pertaining to positive development in children. First, development in every domain involves a complex interplay between genes and environments (Shonkoff & Phillips, 2000). Specific exposures to physical or social phenomena, together with genetic predispositions, impede or promote different aspects of positive development. That is, specific domains of positive development are affected by specific gene-environment interactions. Second, there is an integrity to development across domains (Lerner, Fisher, & Weinberg, 2002; Zaff, Smith, Rogers, Leavitt, Halle, & Bornstein, 2003). For example, certain cognitive and communicative competencies develop in tandem. The capacity to regulate emotions and emotional understanding often contribute to the quality of social relationships as does the ability to cognitively construe information. Indeed, there tends to be constant interplay between emotional states and social interactions. In sum, positive development in one domain will tend to affect developments in other domains. Positive development in some areas is, in fact, very difficult to achieve in the absence of positive development in connected areas. Genetic vulnerabilities and negative environmental exposures, thus, have the potential to negatively impact multiple developmental systems, even if their initial negative impact may be concentrated on one.

As we move into the complex, rapidly changing social/economic ecologies of 21st Century, the challenges to positive development become more formidable. As children grow, their social world expands to include a broader array of other people, social situations, and social institutions. As that social world expands (especially in complex modern technologically advanced societies), social demands and the tasks of social engagement become increasingly complex, with a higher likelihood of potentially damaging encounters. In such a milieu, it seems probable that positive functioning in one domain of development will depend even more on positive functioning in other areas than has been the case in previous eras. By extension, an argument can be made that recovery from physical, chemical, or social insults in one domain will require positive development in the others. These two particular subsidiary hypotheses will be addressed as part of the larger network of hypotheses pertaining to positive development.

The key issue for a study concerned with understanding how negative environmental exposures may impact child well-being is the details of how positive development in one area subserves positive development in a second area or how it protects against negative development in another area for children who are genetically vulnerable or who encounter negative environmental conditions. Too little is known about such complex interplays across developmental domains through the life-course, for different groups, or under different conditions. Thus, it is important to track developmental processes that seem not only important in their own right but that seem to support development in other areas of human functioning. If exposure to negative environmental circumstances affects these processes, then there is greater likelihood of downstream negative impacts on other areas of development as well – the cascade of negative events and consequences described earlier. Likewise, there is greater likelihood of co-morbidities. By the same token, interventions aimed at these processes may have the greatest potential pay-off as regards recovery from negative exposures and resilience in the face of adverse circumstances.

In overview, there is substantial need for longitudinal assessments of the origins and trajectories of positive outcomes in children and youth, and examination of the psychometric adequacy of positive psychological constructs. Several social commentators and scientific investigators have made a start (e.g., Bennett, 1993; Benson, 1993; Lerner, Fisher, & Weinberg, 2000; Seligman, 2002; Bornstein, Davidson, Keyes, Moore, & the Center for Child Well-Being, 2003). As part of its overall goal to understand how environments help shape the course of development, the National Children's Study should be at the forefront of defining areas of positive development and studying the role of genetics and environmental exposures in promoting or hindering their developmental course. Likewise, it is imperative to study the interplay between domains of positive development, particularly as it applies to children exposed to toxic physical, chemical, and social environments. This requires repeated assessments of key aspects of positive development beginning in infancy, especially those aspects associated with major life

goals (e.g., school success, friendship formation, participation in social organizations, employment).

Although there is value in measuring and investigating all areas of positive development in children, the purpose of this hypothesis is to document and evaluate several key components of positive development that subserve human adaptive functioning more generally. That is, there will be a focus on those components of positive development that appear to promote adaptive functioning across multiple domains of human activity, which promote resilience in the face of adverse circumstances and genetic vulnerabilities, and which are critical to the accomplishment of major life goals (e.g., school success, friendship formation, family formation, career success, and community involvement). The secondary purpose of this hypothesis is to examine the impact of key social environmental factors in terms of their contribution to the promotion and the undermining of positive development in these key developmental systems – in this respect, it will integrate with the larger hypothesis on social environmental effects promulgated by the Social Environments Workgroup. The tertiary purpose is to examine interactions between genes and social environmental factors in terms of their potentiation of negative impacts on development in these key areas of developmental functioning. The key components of positive development to be examined are those for which there is evidence of (a) continued importance to adaptive functioning from infancy through adulthood, particularly in the sense that optimal functioning in other systems continue to depend on their level of functioning as does the accomplishment of key developmental goals (e.g., school success, maintenance of friendships, involvement in social institutions, career advancement, family functioning); and (b) which have been shown to be vulnerable to negative exposures from the physical and/or social environment. The systems of positive development to be examined include:

1. sensory acuity and integration
2. neurodevelopmental functioning
3. executive functioning
4. language, literacy, & numeracy
5. self-regulation (both emotional and behavioral)
6. stress resistance/reactivity
7. social competence
8. academic performance

Evidence suggests that these systems of positive development are associated with most of the major life goals of childhood, including school success, friendship formation, positive relations with adults, happiness, productive involvement in social organizations, and entry into the workforce (Shonkoff & Phillips, 2002; Bornstein, 2002; Eccles et al., 2001). NOTE: A recent report by the Committee on Biology and Behavior of the Institute of Medicine (2001) follows this same line of argument as regards positive health and its connection to physical and social functioning through the life course. These systems of positive development also appear to afford protection against adversity and reduce the likelihood of risky behavior and mental illness (Masten, 2001; National Research Council, 1993). To advance understanding of how these systems of positive development are implicated in the attainment of developmental goals (listed above), afford protection against adversity and help reduce the likelihood of risky behavior and mental illness, the NCS will test a series of hypotheses about these relations, with particular attention to changes in patterns of relations through time.

Guiding Principles (Framework) for Investigating Hypotheses

1. From conception through adolescence children in different biological and environmental niches face differing risks and potentialities for positive development.
2. Development in every domain (phenotypic expression) results from the dynamic interplay of genes and environments enacted through time.
3. Exposure to harmful physical, chemical, and social substances (e.g., prenatal drug exposure, lead paint, herbicides, fatty diets, family conflict) reduces the likelihood of positive development. However, both the degree of negative impact and the degree of

recovery will be mediated through the interaction of genetic propensities and environmental supports and constraints.

4. Positive development (i.e., children's behavioral and attitudinal capacities or personal assets) plays a role in moderating the impact of environmental toxins (physical, social, chemical) on the emergence, timing, duration, and severity of detrimental health outcomes. This principle directs attention to the active role of children in their own development – a key consideration of any effort at intervention or prevention.

This framework assigns normative or positive development a pivotal role in understanding whether a child will resist or succumb to negative environmental exposures. Essential mechanisms affecting long-term functioning and health include how the child reacts to stress (Repetti et al., 2002) and the child's capacity for resilience in the face of adversity (Masten, 2001). Correspondingly, the presence and strength of these mechanisms/assets are affected by exposure to potentially deleterious environments. In effect, positive development both depends on and conditions exposures to negative environmental circumstances (see also, Shonkoff & Phillips, 2001).

Within this framework, the Development & Behavior Workgroup recommends:

- (a) continuous assessment of the 8 aspects of positive development listed above be made beginning in infancy (or as soon as is developmentally appropriate and reliable measures are available);
- (b) analyzing the impact of specific classes of physical, chemical, biological and social agents on each aspect of positive development and charting the downstream consequences of these impacts on later cognitive, social, and physical functioning;
- (c) building a descriptive data base pertaining to the 8 aspects of positive development that can be used by other workgroups to help them interpret findings from analyses of their approved hypotheses;
- (d) allowing examination of associations across developmental domains that should further elucidate findings from the testing of hypotheses from other workgroups as well as provide unprecedented scientific information regarding the interplay across developmental domains from infancy onward;
- (e) using the descriptive data base to serve as a frame for understanding key hypotheses pertaining to gene-environment interactions.

Within this framework the Development & Behavior Workgroup plans to examine the following subsidiary hypotheses:

1. The association between self-regulatory competence and other aspects of positive development will be somewhat stronger for children exposed to adverse environmental circumstances and for children with genetic vulnerabilities.
2. The association between executive functioning and other aspects of positive development will be somewhat stronger for children exposed to adverse environmental circumstances and for children with genetic vulnerabilities.
3. The more areas of positive development in which a child shows average to high levels of functioning, the less likely the child will (a) manifest specific negative outcomes from negative environment exposures, (b) manifest co-morbidities related to specific negative outcomes, (c) continue to manifest severe symptoms pertaining to a negative outcome; and (d) respond positive to intervention efforts. These "effects" will be more pronounced for outcomes within the same developmental domain as the available positive assets.
4. (largely the inverse of #3). The fewer areas of positive development in which a child shows average to high levels of functioning, the more likely (a) the child will show negative outcomes from exposure to adverse environmental conditions, (b) the child will show negative outcomes when genetic vulnerabilities are present, and (c) the child will manifest co-morbidities or extended patterns of symptomatology, and (d) the child will show low responsiveness to efforts to intervene.

5. At each point in the course of development, status in each of the 9 aspects of positive development listed will be associated with status in the other 8 areas, albeit associations will be stronger for aspects within the same broad developmental domain (e.g., cognitive) than across domains.
6. Status in each of the 8 aspects of positive development listed will be associated with status in the other 7 areas at later points in time (i.e., they will promote positive development in other spheres of human functioning) – again, associations will be stronger within than across domains of development.
7. Cross-domain associations will be somewhat stronger in early childhood than in adolescence.

The focus on positive development in this hypothesis connects directly to the hypothesis dealing with social environmental effects submitted by the Social Environments Workgroup. Consistent with their hypothesis we recommend that two classes of social environmental experiences be examined periodically from infancy through adolescence: (a) those factors thought to increase stress and/or reduce a child's capacity to cope with stress; and (b) those factors thought to increase a child's capacity avoid or cope with stress. Factors that induce stress are those that pose direct threats to physical well-being or emotional security and those that create a sense of unmanageability or loss of control. They include exposure to conflict, family/community disorganization, parental neglect, maltreatment, and family/community instability. Factors that increase a child's capacity to cope with stress are those that increase a child's sense of worth and agency, promote self-organization, increase a child's sense of control, and facilitate the acquisition of strategies for problem solving. They include parental warmth and acceptance, caregiver sensitivity and responsiveness, family routines and household structure, adult monitoring and supervision, and exposure to a rich array of learning opportunities. Evidence supporting the likely damage from these stress-inducing social environmental mechanisms and the likely advantages of these stress-resisting mechanisms is substantial as regards a wide array of developmental outcomes (Committee on Health & Behavior, Institute of Medicine, 2001; Luthar, Cicchetti, & Becker, 2000; Repetti et al., 2002). Again, consistent with the hypothesis submitted by the Social Environments Workgroup, we recommend periodic assessments of similar social and physical processes as they reflect children's other key developmental contexts (e.g., schools, neighborhoods).

II. Workgroup(s) – collaboration across Working Groups is encouraged:

The workgroups most central to this hypothesis are: Development and Behavior group, Social Contexts, Health Disparities, Chemical Exposures, and Injuries.

III. Contact Person for Proposed Core Hypothesis\Question (include phone and email):

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IV. Public Health Significance:

The promotion of positive cognitive, social and emotional development in children and youth is a national priority (Eccles & Gootman, 2001) as is the promotion of positive health in adulthood (Institute of Medicine, 2001). The consequences of unhealthy development pose an enormous economic and social burden to the nation. Researchers must aim to better understand the factors that work together to promote positive adjustment in children and youth, and to examine these questions across different ethnic/cultural/racial backgrounds in the U.S. A focus on positive development by the NCS is critical to effectively address the health and developmental needs of all children and families in the 21st century U.S.

Positive development in the cognitive, language and academic areas is associated with school readiness; healthy adjustment, academic achievement, and retention in school during childhood and adolescence; these earlier benefits of positive development predict active participation in the labor market in adulthood. Conversely, the absence of positive development in areas of learning and cognition is associated with grade retention, increased use of special education services, school drop out, and unemployment. Many of the educational and occupational disparities across subgroups in the United States can be traced to a lack of support for positive development.

Positive social-emotional development is associated with healthy peer relations, civic engagement, character development, prosocial behavior and the ability to regulate emotions in learning environments. Children with problems in the social-emotional domain are more likely to demonstrate poor adjustment at the transition to school; exhibit heightened externalizing behaviors, such as aggression toward classmates and teachers during middle childhood; and are more likely to be violent, abuse substances, drop out of school, and to engage in early sexual activity and delinquent behaviors in adolescence. Over the lifecourse, they find it difficult to maintain stable family unions and employment.

Positive sensory and motor development affects both social emotional and cognitive development in children. Poor health is associated with lower academic performance, poor peer relations, psychological dysfunction, and limited participation in the labor market.

Justification for a large, prospective, longitudinal study

A large study is critical to understanding the pathways to positive development across subgroups in the U.S. (e.g., children from different ethnic backgrounds), and to identifying factors that lead to disparities within and across groups, within and across locales. Sufficiently large samples are needed to examine pathways at multiple time points, and to model paths to positive development separately within different groups. The power to examine gene-environment interactions within and across subgroups of the population and across stages of development is only possible in a large-scale study. Likewise, the power to elucidate significant (sometime subtle) interplay across developmental domains in and through time requires a large and diverse sample.

A *prospective* study is necessary to explore the ways earlier genes and environments co-act to determine positive or negative developmental outcomes at different points in the life cycle. A large, prospective study is required to identify interactions among earlier contexts and settings in relation to later outcomes in children. A study of this design and scope is also required in order to explore how genes, environments, and positive development co-act to affect the likelihood and course of negative outcomes (a separate proposal for examining gene-environment interactions will be submitted by the DBWG at a later point in time).

A large study affords the opportunity to examine pathways to positive development in ethnically and geographically diverse families who vary in terms of socio-economic status, opportunities, and exposures. The NCS offers an unparalleled opportunity to disentangle the effects of SES from ethnic group membership and area of residence on health, cognitive, social and emotional development in children.

VI. Scientific Merit:

The application of a positive framework to a large-scale, longitudinal study of children's development would facilitate the exploration of phenomena that have received scant attention in prior studies. Little is known about the pathways to success more generally, and less is known about promoting positive development in different ethnic groups. The proposed study would enable researchers to identify transactional relations among multiple environmental exposures,

and describe how these exposures operate in tandem with genetics to impede or foster specific aspects of positive development in children from diverse groups.

No study to date has adequately addressed positive, normative experiences of children from diverse ethnic backgrounds and areas of residence across development, and across environmental experiences and exposures. Much less has there been a study that has examined how positive development in various areas of functioning may be implicated in outcomes that stem from exposures to negative environments. These gaps in the literature are largely this is due to limits to statistical power, as well as the preponderance of deficit models in interpreting life course trajectories. It is rare to find a study that contains a sufficient sample size to test paths to positive outcomes within and across different groups.

VII. Potential for innovative research

This study offers the opportunity to move beyond solely deficit driven research, toward research that speaks to the factors that support positive outcomes in children, youth and adults. The implications of this orientation for effective and timely interventions are far reaching in that most approaches to treatment and intervention have not considered how a focus in some area of positive development (as an alternative or complement to more traditional approaches) may further recovery or reduce co-morbidity.

VIII. Feasibility

Measurement:

A focus on positive development entails specification of valid, age-appropriate measures of children's cognition & language, social and emotional development, and behavior. Although assessing very young children always presents some challenge, there are a variety of assessment instruments available for most of the 9 aspects of positive development listed, some of which have been used in a variety of other large-scale studies (e.g., NLSY, PSID, ECLS, NICHD Study of Early Child Care, Maternal Lifestyles). The DBWG has obtained information on the measures used for these studies. In addition to the efforts undertaken to select and refine measures for use in previous longitudinal studies, several efforts have been taken to review and evaluate existing measures in most of the domains listed. Examples include the CIRCL Forum on Preschool Assessment, the Workshop on measures of early childhood education and school readiness jointly sponsored by ACYF, NICHD, and the U.S. Dept. of Education, and the NICHD workshop on selecting measures for use in large-scale surveys. These reviews, together with the recommendations included, have already been obtained by the DBWG. As well, a pilot study has already been approved to do further review and evaluation of instruments in these domains. That review is being undertaken using detailed guidance from the DBWG as regards the information needed to select appropriate instruments. Depending on the particular sampling plan selected for use in the NCS, some effort will need to be given to translations of some instruments. Moreover, pilot testing of translated instruments will need to be undertaken. In general, the procedures for accomplishing these tasks have been worked out and have been successfully employed in other longitudinal studies.